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TITLE: "The Impact of Electronic Knowledge-Based Nursing Content and Decision-Support on Nursing-Sensitive Patient Outcomes"

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14. ABSTRACT Background: Advances in health information technology (HIT) and the use of evidence-based (EB), clinical decision support (CDS) tools in electronic health records (EHR) hold great promise, but are relatively untested for nurses. Researchers have suggested that the impact of an electronic innovation must include a description of the sociotechnical context as well as the process and outcome metrics for optimal accuracy.

Objective: To use the Dissemination and Implementation of Evidence-based Policy Framework (adapted from Dodson, Brownson, & Weiss, 2012) to evaluate the impact of the KBN Innovation, featuring actionable EB recommendations embedded into policy and the content and CDS tools in the EHR to support nurses to use best practices for six phenomena to improve patient outcomes.

Hypothesis 1: The KBN Innovation, deployed with passive dissemination, will have a positive effect on nursing knowledge, use of evidence-based practices, and the achievement of nurse-sensitive patient outcomes at baseline.

Hypothesis 2: "Active" implementation (audit/feedback of baseline results, education with behavioral expectations, leader-driven unit implementation and maintenance) by nurse leaders and designated staff will improve nurse knowledge and use of electronic and clinical practices and produce measurable improvements in outcomes compared to passive dissemination alone.

Methods: This pre/post intervention trial was conducted with medical/surgical and critical care units (N=23) of a quaternary medical center where the KBN Innovation was deployed. The KBN Logic Model guided the development of nurse and patient surveys, audits/reports, and non-participant observation methods used to gather detailed information about context, care processes and outcomes for each unit. The intervention addressed knowledge gaps and supported units to support/maintain use of essential practices over time (5 months). The units received the same interventions but were randomly assigned to varied maintenance strategies (usual care vs. electronic monitoring).

Results: At baseline, the CDS tools functioned as designed. Gaps were identified on the EB knowledge test (M=55.3% correct, SD 8.5%) and use of EB behaviors. The "active" intervention was delivered to leaders (N=48-100%) and staff nurses (9xx, 92%) with subsequent unit implementation (in progress)**.** Reassessment is scheduled to begin in March 2015.

Conclusion: The conceptual frameworks were useful. Gaps were identified and addressed by training with opportunity for further gap reduction with unit implementation.

NOTE: A Federal Military Advisory Committee is involved in all phases of the project to review and provide input/feedback on the study and identify ways to disseminate findings and applications for the military.

15. SUBJECT TERMS

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INTRODUCTION

This pre/post mixed methods research study is designed to evaluate the impact of Knowledge-based Nursing (KBN) – a technological innovation that features customized evidence-based content and clinical decision-support (CDS) tools in the electronic health record (EHR) specifically designed to support nurses to know and use evidence-based practices (EBP) in their patient care. The project is on track with the projected milestones and timeline with expenses under the established budget.

This report provides a summary of all of our achievements over the past two years. We completed our baseline assessment and identified gaps. We collaborated with international experts in the field of dissemination and implementation science to adapt our conceptual framework and design an intervention that will advance the science by randomly assigning units to varied implementation strategies (A vs. B) rather than treatment and control. We created the curriculum and materials for optimization training aimed at the identified deficits. We provided units with audit and feedback results and supported them to implement and monitor/maintain the EBP over the months that followed. The Team continues to work on processing and thoroughly analyzing the baseline data and preparing for post-intervention assessment (starting in March 2015).

This study represents an in-depth evaluation of the context, deployment, and impact of the KBN innovation at a single, large urban medical center. We are preparing several manuscripts detailing the study protocol, the theory, the methodology, and eventually the findings. We are preparing to ask for the opportunity to repurpose unused (no additional cost) funding from this project to allow our team to replicate this study at a non-urban community hospital to enhance our understanding and improve the generalizability.

KEYWORDS [MESH]

- Decision Support Systems, Clinical
- Dissemination, Information.
- Evidence-Based Nursing
- Health Services Research
- Nursing Evaluation Research
- Nursing Informatics
- Nursing Process Patient Care
- Patient Care Planning
- Outcome and Process Assessment (HealthCare)
- Research methodology

OVERALL PROJECT SUMMARY

Year 1 Summary: The KBN Impact Study Research Team started our work by reviewing the KBNI conceptual framework and Logic Model (Appendix A), and the KBN evidence summaries to identify essential components. We reviewed the literature to identify a suitable way to measure context and factors that influence the knowledge and use of evidence-based practices in patient care with appropriate measures (or create some if not available). The team selected an established tool, the Alberta Context Tool and the associated demographic and research utilization questions to support measurement and comparability. The team developed tools to assess nurse and nurse leader knowledge about the essential practices related to the six phenomena in focus for the study. We also created tools to assess the use of essential practices during patient care with non-participant observations and audits of the electronic record where the nurses documented the care they provided. Tools were also developed to audit documented patient education and to subsequently complete a guided interview ("patient survey") to gather patient perceptions and results of evidence-based patient education that they had received. We also collected descriptive information about the units and the nurse sensitive outcomes that were reported for each unit for the study period. The baseline findings were designed to evaluate the use of the technology and the essential practices under usual deployment conditions that were in place at the study institution. Usual deployment conditions consist of hands-on EHR functionality training (3-8 hour days) for go-live or with orientation if nurses were hired after go-live. Units have their own process for disseminating policies and KBN-based on-line training modules to their staff. The Research Team also validated that the essential content and CDS functionalities were working as designed in the EHR. The Team requested two enhancements to allow nurses to view risk factors and learning assessments during their care. The team refined the protocol for data collection and tested the tools and procedures in an alternate site prior to use for the study. The tools and study protocol were pre-reviewed by the TATRC Regulatory Compliance Specialist and received expedited review and approval by the Aurora Health Care (AHC) Institutional Review Board (IRB) (20-DEC-2013) and the Human Research Protection Office (HRPO) for the US Army Medical Research and Material Command (21-FEB-2014). In addition to the research study, the KBN Team collaborated with the TATRC Contracting Officer Representative - Ollie Gray to establish the Federal Military Advisory Group. The Advisory Group was led by LTC Michael Ludwig, RN-BC, MS, CPHIMS, AMEDD Chief Nursing Information Officer and included members of the Federal Nursing Informatics iEHR Collaborative. The group developed a charter and held ongoing meetings at key stages of the project.

Year 2 Summary: After receiving Aurora Institutional Review Board (IRB) and HRPO approvals, the KBN Research Team immediately informed and recruited nursing units (N=23) into the study. A 4 month study calendar was prepared to schedule observation sessions (4-6 hour sessions for medical-surgical units and 9-6 hours sessions for ICU units) and patient surveys (10 patients/medical-surgical unit). Units were scheduled to collect all unit data within a single month and to avoid days when nursing students were on the unit. When baseline observations were complete, the findings identified that significant gaps in knowledge were present across all 6 of the phenomena with no difference in scores by unit or unit type. The findings were used to create behavior expectations and the plan for delivering optimization training. The Team prepared the curriculum and materials, completed continuing education credit paperwork, and set up the speaker/participant schedule and procedures for recruiting and

delivering 44 - 3.5 hour training session to all nursing leaders (N=48) and staff (approximately 850). In addition to knowledge-deficits, the observations revealed that nurse leader oversight and support for the use of the essential practices was limited – observed primarily during daily team meetings. The intervention was adjusted to provide funding to allow (2) staff nurses who were involved in orienting new staff (preceptors) to have grant-supported time to support implementation on the unit.

In addition to completing baseline assessments, delivering the intervention, and supporting unit implementation, the Team increased their knowledge in dissemination and implementation (D&I) science. To use these theories, the team recognized the importance of being more explicit in describing the core components of the KBN innovation (Appendix B) to facilitate evaluation. Further, the team used the "Dissemination and Implementation of Evidence-based Policy" (Dodson, et al., 2012) that describes that dissemination and implementation processes that are believed to impact the dissemination, implementation, and maintenance of EBP and patient outcomes.

Personnel and Project Administration
Years 1-2:

- AHC completed a legal review and created a financial cost center for the project (FEB-2013)
- The Project Kick Off Meeting was held in MAR- 2013 with on-boarding of Research Team include Researchers (Hook, Gentile, & Singh) and Nursing Informatics Staff (obtained new research credentials and CITI Training); Nursing Informatics Specialist positions and hours were adjusted so staff were available to complete the nonparticipant observations efficiently.
- Job descriptions were created & posted for Project Manager (PM) & Graduate Intern; An interim PM (part time) helped to set up the project plan (PM vacant for 5 months)
- Interviewed, hired, and on-boarded Project Manager – JUN-2013 through JAN-2014; Position was vacant for 4 months until a replacement was hired (MAY-2014)
- Interviewed, hired, and on-boarded Graduate Intern – June 2013; Intern was hired into a Researcher position when she finished her coursework DEC-2013 through AUG-2014.
- Interviewed, hired, and on-boarded a replacement research scientist (JUL-2014) and added another (OCT-2014) for observation data entry, chart audit/entry, data cleaning, and analysis.
- Recruited, hired and on-boarded two Clinical Nurse Specialist (CNS) advisors to support communication and subject recruitment – NOV 2013
- Recruited and on-boarded a nurse leader (site Chief Nurse Executive) to serve as the Patient Care Manager advisor to support Manager recruitment and participation (participates with no reimbursement since salaried with limited hours)– JAN-2014

Consultants:

- The AHC Research Administration Contract Office set up formal contracts with two consultants (Devine and Dowding) named in the proposal
- The Study Team collaborated with Dr. Beth Devine to complete the essential knowledge review and begin to draft the knowledge test questions for nurse/nurse leaders (Consultant work completed with 4 additional hours of effort above budget) – Contract ended JAN-2014
- The Study Team collaborated with Dr. Dawn Dowding regarding study design. During Year 1, Dr. Dowding transitioned her faculty position from the University of Leeds (UK) to Columbia University (USA). Her initial contract was finalized for effort/consultation in Year 2. She reviewed the study protocol and measures and provided feedback. She conducted a

site visit in MAY-2014. She received an orientation to the KBN Innovation and observed all facets of the baseline data collection that was in progress. She provided valuable feedback to the study team.

- The KBN Impact Study has many opportunities to share the work and findings from this study. To address this need, the PI recruited a scientific writing consultant (Chris McLaughlin) – APR-2014 to support the team to create a dissemination plan and to develop a team approach for abstract, poster, and manuscript preparation during Years 2 and 3.

GOAL #1: Identify essential knowledge and nursing practice behaviors (components)
STATUS: Completed Milestone in collaboration with Consultant - 29-JUN-2013

- The KBN Research Team reviewed and systematically analyzed the evidence-based practice synthesis documents to identify essential knowledge & practice behaviors for six phenomena: Acute Pain, Medication Non-adherence, Depressive Symptoms/Suicide, Risk for Falls/Fall-related Injury/Post Fall Management, Pressure Ulcer Risk/Actual, and Delirium Risk/Actual-all Venues (ICU and Med-Surgical)
- The KBN Research Team conducted iterative process meetings to identify the "essential" components - defined as those knowledge or behavior components that are necessary, indispensable, and foundational for staff and/or nurse leaders to carry out the patient care or meet the expected outcome/goal. A spreadsheet was create to support the analysis:
    - Recommendations from the synthesis regarding the assessments, diagnoses, interventions, and outcomes for each phenomena
    - Population specific requirements based on age or risk factors
    - Details about how component is entered into the EHR/functionality (e.g. content or clinical decision)
    - Details about where the component is documented (e.g. flow sheet/Patient Education/Care Plan/Medication Administration Record, etc.)
    - Details about how the researcher knows the component was completed
    - Details about how the researcher know if a CDS tool was used correctly
    - Details about which components are embedded into a policy or standard

GOAL #2: Validate that essential KBN electronic content/tools are incorporated in the electronic health record (EHR) and functioning as designed
STATUS: Completed Milestone w/addtl build to support manual screening – 12–DEC-2013

- Utilized findings from Goal #1 as the basis for the gap identification conducted simultaneously during syntheses review of essential knowledge and nursing practice behaviors (preliminary list of gaps identified).
- Submitted specifications (17-Jun-2013) for building the "sidebar report" a print group report that provides nurses with viewable information about patient risk factors for use in matching interventions and patient education. Completed and tested.31-Aug-2013
- Submitted specifications for building manual mechanism for initiating additional screening tools even if they do not trigger based on patient assessment on admission – DEC 2013
- Submitted specifications for daily and monthly electronic report for capturing depressive symptom, cognitive and medication adherence screening on the Key Performance Indicator daily and Monthly reports. NOV-DEC 2013.

GOAL #3: Develop reliable and valid measures and measurement processes for evaluating the implementation and adoption of KBN-based practices
STATUS: Completed Milestone – DEC-2013
Measure Development (refer to details in Research Accomplishments)

- Nurse Survey - 4 part tool including the Alberta Context Tool, demographics, research utilization questions, and KBN Knowledge Test (41 questions evidence-based practices described in system nursing policy based on KBN)
- Nonparticipant Observation Tools during admission and ongoing patient care
- Audit Tool for evaluating associated documentation during admission and ongoing care
- Patient Survey including preliminary medical record review
- Process and Outcome Metrics: Process and outcome metrics were identified in the study protocol and will extracted from existing sources.

GOAL #4: Conduct baseline measurement to identify gaps (knowledge, practice behaviors, or EHR build) to improve the integrity of the planned KBN intervention study
STATUS: Completed Milestone – 30-JUN-2014

- AHC Biomedical Institutional Review Board (IRB) Study #13-142E approved the study with expedited review a with waiver of documentation of informed consent for nurse subjects, HIPAA authorization for retrospective medical record review, and requirement for maintaining a copy of the patient subject consent in the subject's medical record.
- DOD/USAMRMC Award #W81XWH-13-1-0034 protocol was submitted for review to the US Department of Defense Human Research Protection Office (HRPO) JAN- 2014
- Brigit Ciccarello, M.A., Regulatory Compliance Specialist, Telemedicine & Advanced Technology Research Center (TATRC) Research Program Officer advised proceeding with the administrative steps for unit/subject recruitment with initiation of data collection once HPRO approval was received.
- Recruitment meetings were kicked off with study site Nurse Leaders on 7-Jan-2013. A recruitment video was created to support a consistent message to all eligible units/nurses. Unit-level recruitment meetings were held with the use of a recruitment video. Unit recruitment was completed 28-FEB-2014 with all units (N=23) agreeing to participate.
- Baseline assessments were carried out between 11-MAR through 30-JUN-2014
  - *Nonparticipant Observations* (N=379 RN/Patient observations, 54 Nurse Leaders observations, and 40 RN/Patient admission observations)– Completed 27-May-2014
    Observations were conducted per protocol on all the study units (6 hour sessions)
    Med/Surgical Units = 4 observations/unit (approximately 25 patients/unit)
    Critical Care Units = 9 observations each (approximately 20 patients/unit)
    Admissions (n=2/unit) were observed (3 units did not complete admission observations because patient admission processes were completed by another unit).
    Nonparticipant Observations were gathered using (2) paper-based tools and transcribed into an electronic data collection tool based in SurveyMonkey ™ software.
    Data entry for nurse leader observations was completed 15-AUG-2014 and for non-participant observations by SEPT-2014
  - *Audits* (N=379 + 40 Admissions)
    Near real time auditing was not possible because most staff worked 12 hour shifts with data entry extending beyond the end of the observation time. The audits were conducted retrospectively using the established process. Audits took much longer than to complete

(approximately 45 minutes/observation) than initial estimate. Data entry for audits was completed JAN-2015

- *Patient Survey* – Study Period 11-Mar-2014 through 27-May-2014
  Patients (n=185) were recruited and interviewed per protocol on the 18 non-ICU units during the study period. Chart audits and interview data were entered using an iPad into Survey Monkey. Data were downloaded into excel, cleaned, and sent to the biostatistician with analysis plan.
- *Nurse Survey* - Study Period 27-May-2014 through 30-JUN-2014
  The Nurse Survey Tool was opened for data collection after unit observation were completed to minimize staff awareness of the practices that were being tested and observed for during the nonparticipant observations. The Nurse Survey was "kicked" off with the Nurse Leaders with fliers and email message sent to staff nurses employed on the study units and hospital float pool. The link to the confidential Nurse Survey was delivered to eligible participants using the Learning Connection. The research team monitored participation and provided participation reports to the unit nurse leaders to support recruitment.
- *Process and Outcome Metrics*: Unit-based nurse sensitive outcome data were gathered from various sources including the EHR, hospital census (e.g. Patients/Patient Days, Length of Stay), and the incident reports (e.g. Falls/Injuries, Pressure Ulcers) and patient satisfaction (HCAPS) reports reported to external monitoring company used by the study institution. All units received a summary outcome report of measures pertinent to the study as part of the audit/feedback component of the intervention to support nurse leaders to identify priorities for implementation on the unit (Refer Appendix D – Baseline Findings for a sample). Further analysis of outcomes is in progress.

GOAL #5 Design the Intervention Study strategy including the delivery method
STATUS: Completed milestone – 30-AUG-2014

- Developed schedule and logistics for Optimization Training sessions to accommodate all 942 eligible staff nurses using electronic registration tracking system (Learning Connection). 30-JUNE-2014 (Note: The dates and rooms had to be set up in advance to allow nurse leaders to preplan classes and unit staffing and ensure room availability.)
- Findings from the Patient and Nurse Survey findings and Nurse Leaders Observations were analyzed and used to identify knowledge gaps - completed 15-AUG-2014
- PI participated in the 2014 Training Institute for Dissemination and Implementation Research in Health (TIDIRH) and networked with national/international experts to adapt the conceptual framework (Appendix A) and to confirm the best study intervention (audit/feedback, training with behavioral objectives, unit implementation, and maintenance) with a plan to randomize based on strategy for monitoring implementation. 25-JUL-2014
- Units were randomized into two groups (A & B) based on difference in strategy used to monitor implementation (usual care vs. electronic monitoring using reports) (Appendix E)
- Finalized format, learning objectives, methods, behavioral expectations, training materials and evaluation for the Nurse Leader and Staff Nurse Optimization Training course featuring an overview with four "break-out" sessions focusing on identified knowledge gaps including:
  - Navigator/Flowsheets/Care Planning
  - Mental Status (Delirium Risk/Actual)/Depressive Symptoms

  - Pain – Comfort/Function
  - Patient Education/Medication Nonadherence
- Developed (2) training videos to deliver study overview and audit/feedback results at baseline) and (6) brief videos to demonstrate key training content (e.g. mental status assessment (4), ADL assessment (1), and depression screening) 31-AUG-2014
- Created training materials for the training sessions:
  - Hand-outs: Eight page handout included an overview describing the KBN core components and a list of the "essential practices" for implementation on the unit and worksheets for each session to practice the documentation during the case studies. (Duplicated and collated 950 sets) (Appendix E)
  - Reference Materials: 25 folders containing 15 printed reference sheets of content available in the EHR for participants to reference throughout the sessions.
  - Humorous incentive: "BINGO" game with template filled with key KBN words to enhance participant interaction. Winners received "I Won at KBN BINGO" button and were encouraged to wear them on their units to promote the training & encourage adoption.
- Completed the continuing education credit application including speaker biography and conflict of interest review and support/budget letter from USAMC sponsor. The course was awarded 3.67 contact hours from the Wisconsin Nurses Association.
- Developed a "Trainer Schedule" for KBN team and worked through Outlook to block schedules and to staff all of the training sessions.
- Worked with the Aurora Conference Center staff and online meeting space reservation systems at two locations in arrange audio visual requirements and room set up for all 44 training sessions at two sites.
- Collaborated with the Learning Connection staff to generate weekly lists of nurses enrolled in the training sessions and communicate unit-based registration data to monitor progress to the Nurse Leaders.

GOAL #6 Carry-out the intervention study at the ASLMC site
STATUS: Completed milestone – 02-DEC-2014

- Optimization Training was delivered for all Nurse Leaders (100%). 4-SEPT-2014
- Optimization Training for staff nurses was started on 9-SEPT-2014. The initial plan was to utilize breakout sessions to promote small group discussion for enhanced learning. The first session revealed that small group discussion led to variations in content delivery with challenges to time management. We altered the training plan immediately, reducing the number of instructors to 2-3 per session and promoting small group table discussions with the larger session rather than breaking out. Logistical adjustments were made to the "Trainer Schedule" and meeting room reservations to accommodate the change.
- Staff nurses were encouraged to use the Kronos clock at the training center to enter their hours directly into the Study cost center for optimal accuracy of their in-service time.
- Collaborated with the Learning Connection staff to update the tracking system with confirmed attendance for documentation and dissemination of contact hour certificates.
- A weekly attendance report was sent to Nurse Leaders so confirm attendance. The PM and the Post-Award Grant specialist worked closely with the nurse leaders to ensure accurate and timely reimbursement for staff nurse training participants.
- Optimization Training Session evaluations were summarized (Appendix E)

- Optimization Training was delivered for 90% (N=849) staff nurses 31-OCT-2014 with supplemental training sessions for unit preceptors by study group (A & B) to review the essential practices, their role, and how to use assigned monitoring strategy.

GOAL #7 Complete tracking process of the intervention
STATUS: In progress (1-NOV-2014 to present)

- Meetings were held with unit leaders to support them to engage their preceptor staff (2/unit) to implement the essential practices by identifying priorities and working to improve adopter skills by monitoring and providing feedback to maintain the practices on the unit.
- Created a tracking tool (Appendix E) to monitor preceptor use of indirect time on their unit.
- Enlisted the study site "Magnet" coordinator, who works with units on quality improvement activities, to ensure that the implementation activities align with established priorities and to support unit-based nurse leaders and preceptors to document their follow-up.

GOAL #8 Complete a full evaluation measuring the impacts of KBN methods on patient outcomes
STATUS: Future

- Reviewed baseline data collection forms and made minor adjustments identified as needed during data enter (IRB Modification #9)
- Preparations for Post-intervention Assessment are underway with observations scheduled to start 23-MAR-2015 (see year 3 timeline, Appendix F)

Travel/Conference Attendance
Year 1:

- PI attended 2013 Midwest Nursing Research Society Conference-Chicago to recruit intern (MAR-2013) and participate in preconference session on Implementation Research- NOT funded by Grant
- PI and Graduate Student Intern attended the Annual AMIA Informatics Conference (NOV-2013) in Washington DC to network and participate in a preconference workshop on patient engagement
- Federal Military Advisory and/or TATRC Review – Presentations not requested - Travel was deferred.

Year 2:

- Clinical Decision Support (CDS) consultant traveled to Milwaukee (May-2014) to meet with the team and observe the research methodologies in progress.
- PI collaborated with Graduate Student Intern and Consultant to submit an abstract for the Annual AMIA (Informatics) Conference in Washington DC for an interactive presentation on Patient Engagement in Acute Care - it was not selected for presentation. PI submitted details about KBN Impact Study with sponsor information for a report presented at the AMIA Nursing Informatics Working Group (NIWG) Fall Symposia Event (Sunday 16-NOV-2014); PI attended annual AMIA conference to network and attend sessions.
- Federal Military Advisory and/or TATRC Review – Presentations not requested - Travel was deferred.

KEY RESEARCH ACCOMPLISHMENTS

1) Institutional Review Board and Human Research Protections Office Review

Protocol Title: "The Impact of Electronic Knowledge-Based Nursing Content and Decision-Support on Nursing-Sensitive Patient Outcomes"

Approvals/Continuing Reviews to Data:

- Aurora IRB Approval #13-142E 20-Dec-2013: Updated with Waivers 1/3/14
  Aurora IRB Continuing Review of Expedited Study (Exp Cat 5 & 7): Approved 11/24/15
- Human Research Protections Office Approval Log No. A-17696 EDMS #5648 21-Feb-2014
  Approved Continuing Review documents w/ updated protocol acknowledged -19-DEC-2014

Modifications:

- AHC IRB Modification #1 –Ketchum added (completed CITI Training & Orientation) – Approved 08-JAN-2014
- AHC IRB Modification #2 – Removing Hartwig/Mills, updating *Patient Survey question with review of Unit Recruitment Video – Approved 31-JAN-2014
- AHC IRB Modification #3 – Review of *observation/audit forms - approved 03-FEB-2014
  *Note – Final/AHC IRB approved versions of the Patient Survey and Nonparticipant and Audit forms were forwarded to HRPO prior to final approval
- AHC IRB Modification #4 - Updated HRPO address with Patient Consent edits requested by HRPO – Approved 28-FEB-2014
- Study Protocol and AHC IRB approved documents with HRPO edits were reviewed by Patricia Shank, CTR for US ARMY MEDCOM for review
- Study Protocol submitted to HRPO - Dr. Laura R. Brosch, RN, PhD, Director of the Human Research Protection Office (HRPO) Office Approved 21-FEB-2014
- Aurora IRB acknowledged received of HRPO Approval Letter– 24-FEB-2014
- AHC IRB Modification #5 with final Nurse Survey with Learning Connection ppt to introduce survey - Approved 25-MAR-2014
- AHC IRB Modification #6 to add Interim RN Data Collector (completed CITI Training and Orientation) with updated PI Address (moved to new location)– Approved 10-APR-2014
- AHC IRB Modification #7 to add Project Manager (Nikolic) and Research Scientist (Badger) (completed CITI Training and Orientation) with revised fliers for Nurse Survey recruitment – Approved 03-JUN-2014
- AHC IRB Modification #8 with updated IRB Document and Study Protocol (Version #3 – 06-NOV-2014) with updated conceptual framework including details about randomization plan, optimization training, and unit implementation. The Nurse Information Letter and Patient Consent forms were updated with PI address change in preparation for post-implementation assessment. Added Research Scientist (Martens) (completed CITI Training & Orientation) to replace Bauer (resigned to focus on dissertation) Approved 20-NOV-2014
- AHC IRB Modification #9 with updated Study Protocol (Version #4 – 09-FEB-2015) with editorial changes to enhance background and process description, updated observations and audit forms to capture data that were written in during baseline assessments, updated fliers and other study materials with revised PI contact information, updates to the Nurse Survey Learning Connection module in preparation for use during post-intervention assessment. Updated role for research scientist (Badger) to include recruitment, consent, and data

collection of Patient Survey (in place of Bauer) and added clinical advisor (Marzinski – Site Magnet Coordinator) for limited hours to support tracking of unit-based implementation including preceptor staff use of maintenance tools and tracking form. Approved 15-Feb-2015

2) **Updated Theoretical Framework and Intervention Plan for the Study**

The KBNI Conceptual Framework (Appendix A) continues to be used by the Study Team to describe the essential components of the KBN innovation. The KBN Logic Model and Patient Engagement Model (Appendix A) continue to describe the concepts, measures, and outcomes of the study.

During Year 1, the KBN Team reviewing the literature and selected the Dissemination of Evidence-Based Policy framework (Appendix B) by Dodson, Brownson, and Weiss (2012, p. 440) to explain how context and dissemination and implementation strategies influenced the adoption and use of a new innovation. Although the model is conceptualized for public health, the concepts appeared to be relevant to the evidence-based policy process used in acute care. Dodson and colleagues (2012) describe three key domains to implement evidence-based practice: policy content, policy process, and policy outcomes. "Policy content" focuses on identifying the specific evidence based policy elements that are likely to be effective. "Policy outcomes" refers to the overall effect of policy implementation. "Policy process" refers to the many factors including the structure and scope of the process, the presence and standing of the policy "sparkplug" (facilitator) and their ability/skills to articulate, advocate, and communicate support for the policy. Leaders can choose a "dissemination" (passive) approach to increase target audience "awareness". They can also choose an "implementation" (active) approach with active strategies that facilitate the adoption, implementation, and maintenance processes. "Adoption" is defined as "a decision to make full use of an innovation as the best course of action available" and to take steps to identify and address barriers to adoption. "Implementation" refers to 'the extent to which an innovation is carried out with completeness and fidelity" with a focus on improving the skills of the adopters through training and technical assistance. "Maintenance" refers to the extent to which an innovation becomes embedded into the normal operation and maintained by policy enforcement (p. 440).

UPDATE: During Year 2, the PI had the opportunity to participate in a training institute for Dissemination and Implementation Science (TIDIRH), funded by the National Institutes of Health (NIH) – (Refer to Additional Accomplishments section). The goal for institute attendance was to obtain guidance and support for adapting the Dobson et al., (2012) conceptual framework with additional details for use with nurses in acute care and for assistance with designing the intervention because we were having difficulty designing a control/placebo intervention. The international experts (including Dr. Brownson – an author of the Dodson et al. model) supported the conceptual framework adaptation and advised us to be more specific about the core components of our intervention and to utilize a multifaceted implementation strategy with head to head comparison rather than using a "control" group with dissemination since there is little evidence that dissemination by itself is effective. As a result of the consultation, the team worked to be more specific regarding the core components of the intervention (Appendix B), adapted the theory (Appendix C), and adjusted the Intervention (Appendix E).

The adapted theory (Appendix C) supports the evaluation of both hypotheses in this study - that passive dissemination of the KBN Innovation (policy/EHR embedding) can affect the use of evidence based practices and patient outcomes (baseline); however, we believe that the innovation will be more effective if active implementation and maintenance strategies are used by nurse leaders to increase clinical use of behaviors and achieve improved outcomes over passive dissemination alone. The model describes the importance of "adoption", having clear behavioral expectations, assessing/improving adopter skills and the use of maintenance strategies to ensure use. Dodson and colleagues also indirectly referred to the use of a "sparkplug" (facilitator) to achieve and maintain/enforce use of the evidence-based process but offered no specific details about this role in the model. Our baseline findings suggested that nurses leaders were not often observed giving feedback to staff regarding the phenomena in focus for this study. We recognized that the study site uses staff nurses to serve as unit "preceptors" who are responsible for role modeling, educating, and socializing new staff. We asked nurse leaders to identified (2) preceptors to support them to implement evidence-based practices on their unit.

The Intervention was revised to use a multifaceted implementation strategy with a comparison of strategies used to monitor and maintain the change. Implementation refers to the "process of putting to use or integrating evidence-based interventions within a setting" (Rabin, et al., 2008, p. 118). Researchers have reported that multifaceted implementation strategies are more effective in supporting nurses to use evidence-based practices during patient care (Ista, et al., 2013; Ivers, et al., 2012, Matthew-Maich, et al., 2013; Wuchner, 2014). Commonly used implementation strategies include (1) embedding the practices into organizational structures such as policies and documentation (Matthew-Maich, et al., 2013), (2) audit/feedback, (3) educational meetings with clear behavioral expectations, and (4) leadership strategies to improve and maintain adopter skills over time (Wuchner, 2014). Audit and feedback, defined as "a summary of clinical performance over a specified period of time", is used to prompt professionals to modify their practice behavior to be consistent with established standards (Ivers, et al., 2012), In a systematic review, audit and feedback as an implementation strategy was associated with small (4.3%) but potentially important improvements in practice, and was most effective when baseline performance is low, when given by a supervisor or colleague, provided more than once, delivered in verbal and written formats, and with explicit targets for improvement (Ivers et al,, 2012). Educational meeting strategies have some effective but insufficient for implementing research into nursing practice by itself (Ista, van Dijk, van Achterber, 2013; Thompson, et al., 2007; Wuchner, 2014). Huis and colleagues (2013) reported using leadership involvement with social influences and leader-directed monitoring and associated these activities with improved implementation. Other researchers reported the positive effects of engaging formal leaders and informal opinion leaders in actively influence the knowledge, attitudes, and behaviors within the community (Park, et al, 2014; Flodgre, et al., 2011; Gifford, et al., 2013; Huis, et al., 2013; Valente, Pumpuang, 2007). Gifford and colleagues (2013) reported that nurse leaders did not routinely monitor adherence to guideline-based care but it may be that clinical presence, explicit communication, and delegation of initiatives and responsibilities may be needed for success. Tools may be needed to help leaders to monitor and know if/when best practices were used in daily practice (Gifford, et al, 2013; Ista, et al., 2013; Matthew-Maich, et al., 2013).

3) Baseline data collected with preliminary analysis to support Optimization Training
The baseline assessments were completed between 11-MAR and 30-JUN-2014. Data were gathered from every participating unit with random sampling of patients for non-participant observation and audit (N=379 ongoing and 40 admissions). Patient interviews/surveys were conducted on the medical surgical units (N=184 – approximately 10 patients/unit). Nurse surveys were completed by staff nurses and nurse leaders (N=479 – 49% response rate).

4) Optimization Training with Preceptor Update
Optimization Training was delivered for all Nurse Leaders (N=48-100%) and staff nurses (N=849 – 90%) with continuing education credits awarded and positive evaluations received. Supplemental training sessions were conducted with unit preceptors by study group (A & B) to review the essential practices, their role, how to use assigned monitoring strategy, and how to track their hours. Demographics information and an evaluation regarding their ability to use monitoring tools were also collected.

CONCLUSION:

The "KBN Impact Study" is proceeding with goal accomplishment according to the plan and under budget. The Research Team has reviewed the literature and networked with international leaders in dissemination and implementation research to build a strong theoretical foundation for the study. The study site was solidly engaged in participating in the study as evidenced by 100% of inpatient units recruited for the study, high (49%) voluntary response rate to the Nurse Survey, and high (100% Leader and 90% of Staff Nurse) participation rate in the Optimization Training. We have created useful tools and gathered an extensive amount of real-world qualitative and quantitative data with analysis and hypotheses testing in progress. We are also hoping to utilize unused funding to replicate the study (no-cost extension of this grant) in a smaller, community site to increase generalizability of the findings. We look forward to completing the post-intervention assessment and sharing results of this important work over this our final year.

PUBLICATIONS, ABSTRACTS, AND PRESENTATIONS

Publications – Manuscripts in progress

- KBN Impact Study Protocol Paper for journal: Implementation Science
- Theory Paper re: the adapted Conceptual Framework for the Dissemination and Implementation of Evidence-based Policy
  Journal: Journal of Advanced Nursing
- Methodology Paper re: Mixed Methods Study for Baseline
  Journal: Computers, Informatics, Nursing (CIN)

Abstracts

- Abstract submitted to AMIA Conference (MAR-2014) for Fall 2014. Preliminary findings were in progress so we did not have data to qualify as a research submission. The Research Team collaborated with Dr. Dowding (consultant) and another colleague to submit a proposal for an interactive panel presentation on Patient Engagement in Acute Care.

Results: Not accepted

- Abstract submitted: Midwest Nursing Research Society (MNRS) – Spring 2015
  Title: "Using Implementation Theory to Evaluate the Impact of Technology to Support Evidence-Based Nursing Practices in Patient Outcomes in Acute Care."
  Results: Accepted for poster presentation - 17-APR 2015 in Indianapolis
- Abstract submitted: 17th Annual Southeast WI –Building Bridges Conference – Spring 2015
  Title: "Using Implementation Theory to Evaluate the Impact of Technology on Use of Evidence-Based Practice and Outcomes in Acute Care" Author: Hook
  Results: Accepted for podium presentation - 08-MAY-2015 in Milwaukee, WI
- Proposal submitted: Annual Epic User's Group Meeting (UGM) – AUG-2015 Verona, WI
  Title: "Using implementation theory to study how technology supports best practice"
  Authors: Hook, Ketchum, Giannini, and Hoffmann
  Results: Pending
- Proposal submitted: Annual Epic User's Group Meeting (UGM) – AUG-2015 Verona, WI
  Title: "Investigating Adherence to Evidence-Based Practice at the Bedside" Authors: Giannini, Hoffman, Ketchum, & Hook
  Results: Pending
- Proposal in progress: Annual AMIA Conference in San Francisco (Due 3/2015)
  Title: "Investigating Adherence to Evidence-Based Practice at the Bedside"
  Authors: Hook & Dowding

Presentations:

- Poster Presentations: "Measuring the impact of evidence-based patient education on patient knowledge and behavior in acute care" Authors: Bauer & Hook at the 16th Annual Southeast WI Building Bridges Research Conference - 09-MAY-2014 – Milwaukee, WI
- Poster Presentations: "Evaluating the Impact of Evidence-Based Patient Education on Patient Knowledge and Behavior in Acute Care" Authors: Bauer & Hook at the Annual Aurora Scientific Day Conference – 21-MAY-2014 - Milwaukee, WI

INVENTIONS, PATENTS AND LICENSES – None

REPORTABLE OUTCOMES: (In progress)

- Adapted Conceptual Framework (Dodson, et al., 2012) used for the study with input from international experts in Dissemination and Implementation Research. A manuscript to publish the KBN Impact Study protocol with the adapted framework, core concepts, and specifications for comparing two implementation interventions is in progress for submission to the journal *Implementation Science*.
- Methodology paper describing the key aspects of this mixed methods study is in progress
- Lesson Plans for training staff nurses, nurse leaders, and preceptors regarding the essential evidence-based practices can be used to scale project for the future.
- Lesson Plans and tracking tools for training preceptors can used to scale project for the future
- Specifications of the standardized content, CDS tools, electronic care plans, and report tools in the EHR are available for use in scaling the project for the future

OTHER ACHIEVEMENTS

2014 Training Institute for Dissemination and Implementation Research in Health
The Principal Investigator submitted an application for the 2014 Training Institute for Dissemination and Implementation Research in Health (TIDIRH; July 20-25, 2014) - an intensive 5 day training seminar to support researchers in designing and conducting dissemination and intervention (D & I) research. Meissner and colleagues (2013) authored a paper about the emerging science of D & I with details about the n. The 2014 training institute (4th cohort) was sponsored by Harvard University and the Dana-Farber Cancer Institute with support from the National Institutes of Health, and the U.S. Department of Veterans Affairs. Dr. Hook was one of 41 participants selected from a pool of 289 international applicants who met the credentialing criteria and proposed a feasible D & I project to work on. The KBN Impact Study protocol and intervention plan was reviewed by national and international experts who confirmed the appropriateness of the conceptual framework adaptation (Appendix C) and the Intervention Plan (Appendix E) with audit/feedback, training, unit implementation) and varied maintenance. The faculty also offered support to the PI for publication of the study protocol and theory paper that were developed as a result of the consultation.

Federal Military Study Advisory Council Collaboration
Year 1:

- Established a collaborative relationship with LTC Michael Ludwig, RN-BC, MS, CPHIMS, AMEDD Chief Nursing Information Officer, Ollie B. Gray RN, MSN, PMP Executive Healthcare Manager, AITG for TATRC and members of the Federal Nursing Informatics iEHR Collaborative
- Orientation meeting (conf call) held with LTC Ludwig and associates – MAR-2013
- LTC Michael Ludwig set-up kick-off /orientation meeting with DOD Nursing Information iEHR Collaborative Meeting – 28-MAY-2013
- Worked with LTC Michael Ludwig to plan subsequent meetings (July 31 2013) with plan to draft a Council Charter
- F/u call (30-AUG- 2013) with Federal Military Advisory Committee. Each branch has their own path/approaches to evidence based practice. Discussed need for determining how similar or different military facilities are from study site.
- The Assessment form was developed and distributed to assess processes used by each branch to support evidence-based practice during the SEPT-2013 meeting.
- Navy Branch Meeting held on 23-OCT-2013, led by Captain Joel Parker to discuss the KBN research project to attendees and request input from Navy Nurses. The Navy representatives discussed where they were in building their documentation system with best practices and associated protocols, etc. for cross military/cross discipline use. Consensus was achieved around the need for strategies to ensure adoption and evaluation re: informatics build to ensure that it was working and supporting the staff to effectively achieve outcomes. The call ended with shared interest but uncertainty regarding next steps.
- December check-in conference call was held 13-DEC- 2013 with Federal Advisory Council. To date, however, none of the branch stakeholders completed the Assessment Tool for gathering information about the nursing structure and where they are with doing evidence-based practice projects supported by informatics. (Assessment deferred)

Year 2

- The KBN Research Team continued a collaborative relationship with our Federal Military Advisory Council led by LTC Michael Ludwig, RN-BC, MS, CPHIMS, Officer in Charge to the Presidential Medical Evaluation Treatment Unit - OIC METU and the members of the Federal Nursing Informatics iEHR Collaborative.
- Conference Calls were held quarterly to update the group regarding study progress including
  24-JAN-2014 to describe recruitment
  7-APR-2014 to describe baseline data collection
  15-AUG-2014 to describe baseline results and intervention plan
- The group discussed the ways in which this research can provide relevant information regarding issues that are facing the participating agencies. LTC Seeley suggested study could be presented at the 2015 Defense Health Information Technology Symposium.

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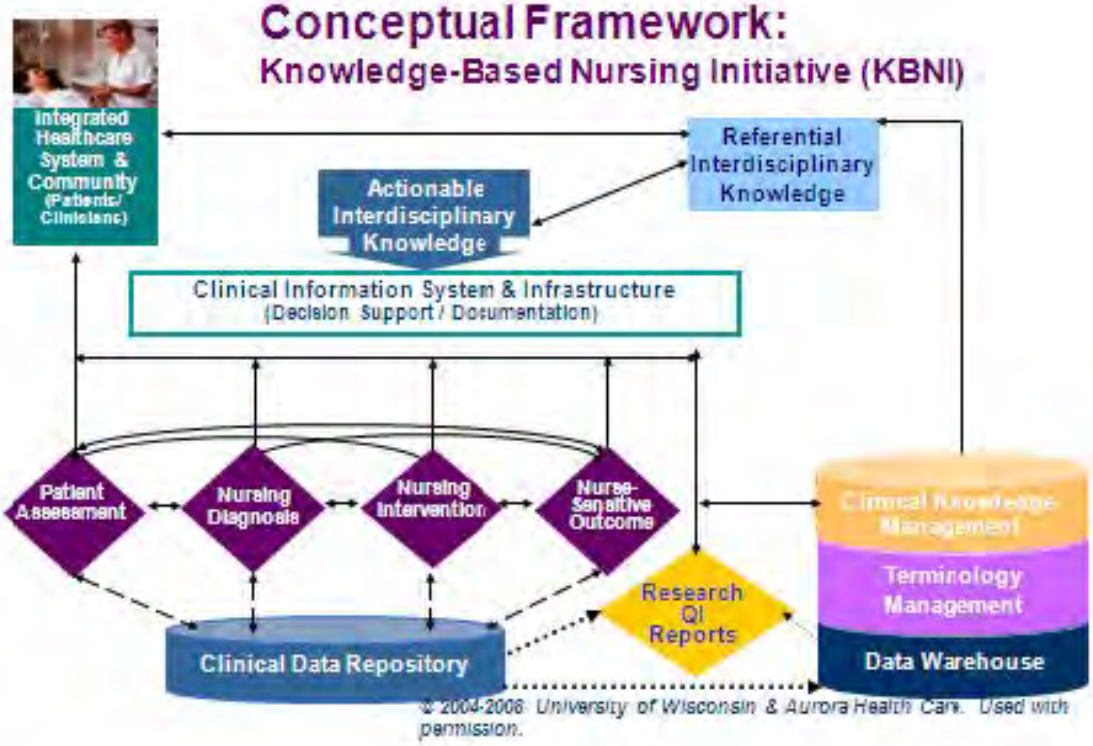
APPENDIX A. KBNI Conceptual Framework, Logic and Patient Engagement Models (Unchanged)



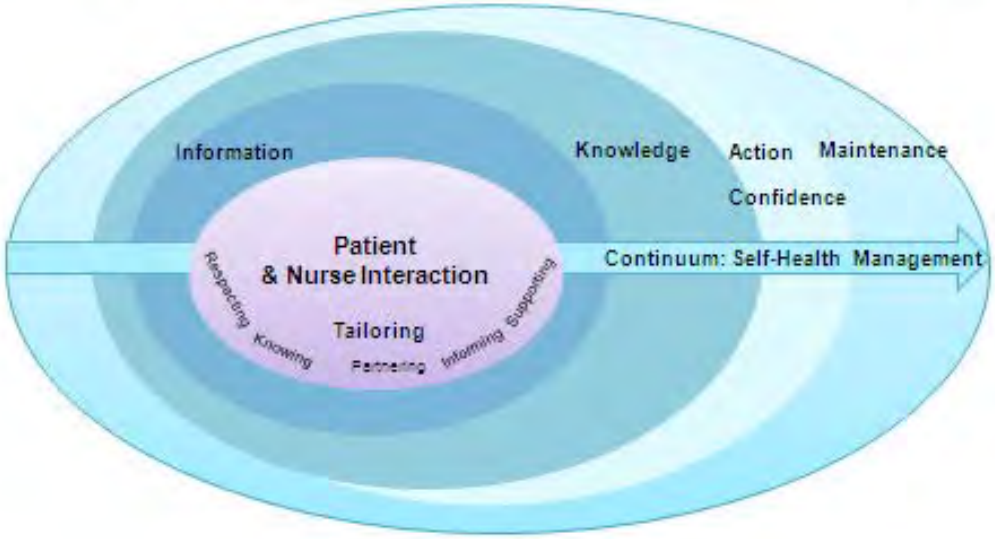
Knowledge-Based Nursing (KBN) Program Logic Model

Inputs	Outputs		Outcomes		
Tools	Activities	Participants	Implementation	Adoption	Outcomes
KBN Conceptual Framework	Aurora System Nursing Culture	Nurse Executives*	Nurse Leader KBN/EBP Knowledge	Nurse Leader Adoption Behavior	Mortality
KBN Syntheses	KBN Dual Track Policy	Patient Care Managers*	Staff RN KBN/EBP Knowledge	Frontline Staff Adoption Behaviors	Length of Stay
Standardized, Nurse-sensitive CPG Elements	Shared Governance (System)	Clinical Nurse Specialists	Accurate Risk-Event Screening	Early Detection of Complications	30 Day Readmission
Electronic Functionality for Care Planning	Nursing Unit Level Environment*	RN (Frontline) Staff	Accurate Problem Identification	Care Plan Interaction	Nurse-Sensitive Adverse Outcomes*
Clinical Decision Support (CDS) Tools	KBN-specific Training	Providers	KBN-based Technology Used Effectively	Technology Acceptance (Ease/Useful, Incl.)	Nurse-Sensitive Outcomes (Beyond Adverse Events)
Patient Level Evaluation Tools	Unit-Level Adoption Support	Patients	KBN-based Collaboration Knowledge	KBN-based Collaborative Behavior	Provider Satisfaction with Collaboration
Aggregate Level evaluation Tools				Patients Receive evidence based Message	Patient Reported Use of Recommendations
			Nursing Sensitive Parameters (Not specifically influenced by KBN Evidence)		
*Externally Reported Nursing-Sensitive Measures: Fall Events/ Fall-related Injuries & Hospital Acquired Pressure Ulcers			Patient Acuity/ Turnover*	RN Satisfaction*	Patient Satisfaction
			Staffing* (Nursing Care Hours/RatioFTE/Education)	RN Turn Over	

Assumptions:
1. KBN Syntheses are updated when significant evidence is published
2. Equal level of leadership and staff turnover
3. No significant change in unit layout or care delivery process
4. Float pool nurses receive same level as Assigned Nursing Staff

External Factors:
1. Units have different physical unit layouts (i.e. access to medications and computers)
2. Large scale system-wide implementation of new EHR system (complete by 2013)
3. System Strategic Plan focused on creating accountable care organization
4. External forces disseminating potentially competing work

Conceptual Model: Using Evidence-based Interactions to Engage Patients



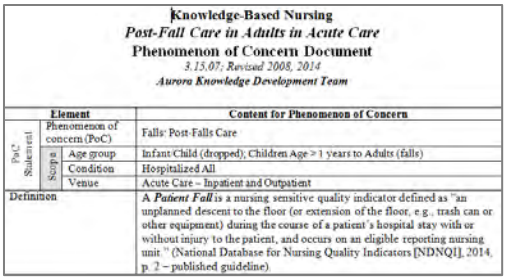
APPENDIX B. Knowledge-based Nursing (KBN) Innovation Core Concepts

Core Components:

1) KBN is a chartered entity within the professional nursing infrastructure at the study institution with goals of contributing evidence-based recommendations to the system nursing practice council for embedding into the content of nursing policy and the EHR. The KBN Department is also responsible for governing the nursing content and workflows in the EHR.

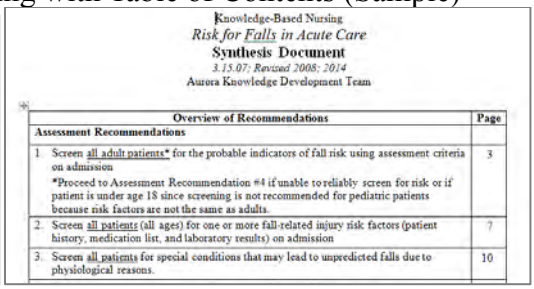
2) KBN Evidence Summaries focus on the independent role of the nurse:
   - "Phenomena of Concern" (POC) Documents (below) details the scope of the review including age, condition, venue, definition, and significance (internal/external rationale)
   - "Synthesis" Documents contain actionable recommendations based on nursing process:
     - Assessments: history and physical/psychosocial findings (with tools as appropriate)
     - Diagnosis: Risk and/or actual problems
     - Interventions: Monitoring for changes in status, intervening to prevent risk or manage problem, and engaging patient and family to support self-management (know and decide care)
     - Outcome evaluation for achievement by the close of the inpatient stay

   - POC Document and Synthesis Document starting with Table of Contents (Sample)



Knowledge-Based Nursing
Post-Fall Care in Adults in Acute Care
Phenomenon of Concern Document
3.15.07; Revised 2008, 2014
Aurora Knowledge Development Team

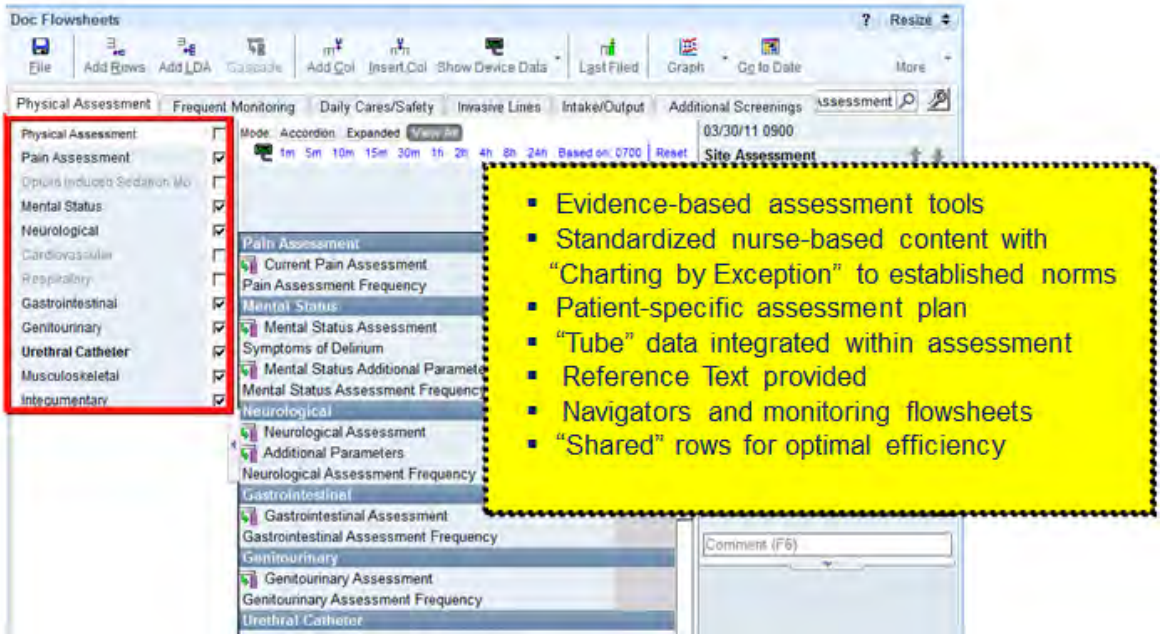
	Element	Content for Phenomenon of Concern
PoC Statement	Phenomenon of concern (PoC)	Falls: Post-Falls Care
	Scope: Age group	Infant-Child (dropped); Children Age > 1 years to Adults (falls)
	Scope: Condition	Hospitalized All
	Scope: Venue	Acute Care – Inpatient and Outpatient
Definition		A ***Patient Fall*** is a nursing sensitive quality indicator defined as "an unplanned descent to the floor (or extension of the floor, e.g., trash can or other equipment) during the course of a patient's hospital stay with or without injury to the patient, and occurs on an eligible reporting nursing unit." (National Database for Nursing Quality Indicators [NDNQI], 2014, p. 2 – published guideline).



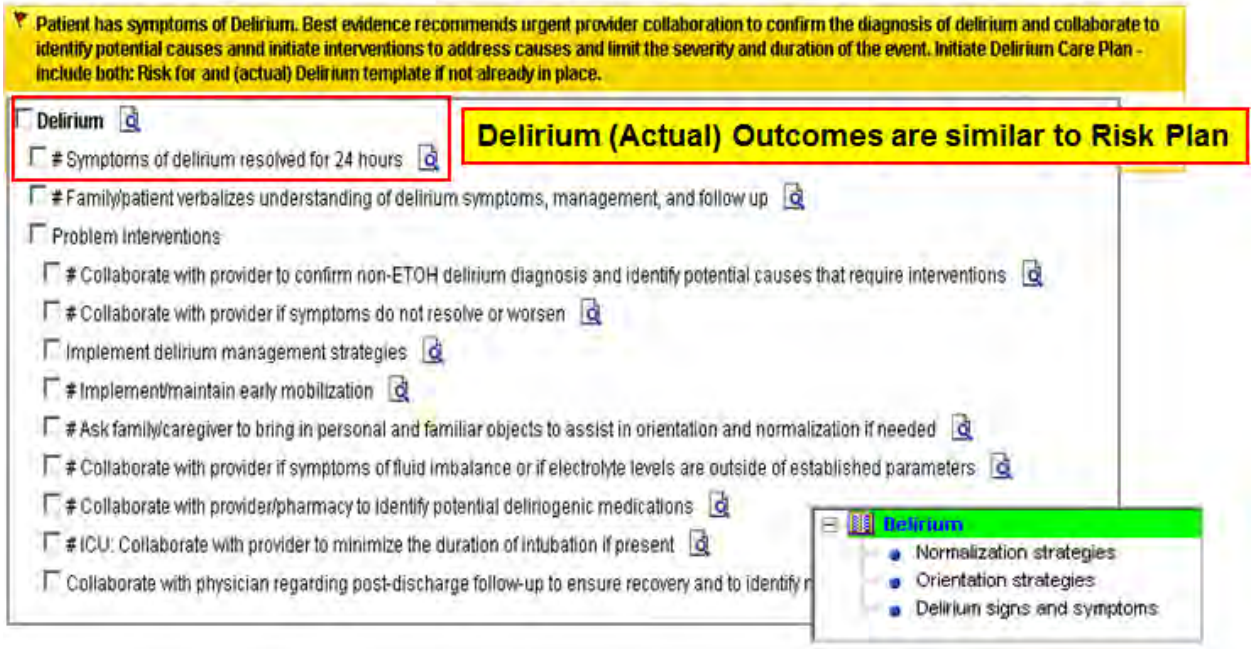
Knowledge-Based Nursing
Risk for Falls in Acute Care
Synthesis Document
3.15.07; Revised 2008; 2014
Aurora Knowledge Development Team

Overview of Recommendations	Page
Assessment Recommendations	
1. Screen all adult patients* for the probable indicators of fall risk using assessment criteria on admission *Proceed to Assessment Recommendation #4 if unable to reliably screen for risk or if patient is under age 18 since screening is not recommended for pediatric patients because risk factors are not the same as adults.	3
2. Screen all patients (all ages) for one or more fall-related injury risk factors (patient history, medication list, and laboratory results) on admission	7
3. Screen all patients for special conditions that may lead to unpredicted falls due to physiological reasons.	10

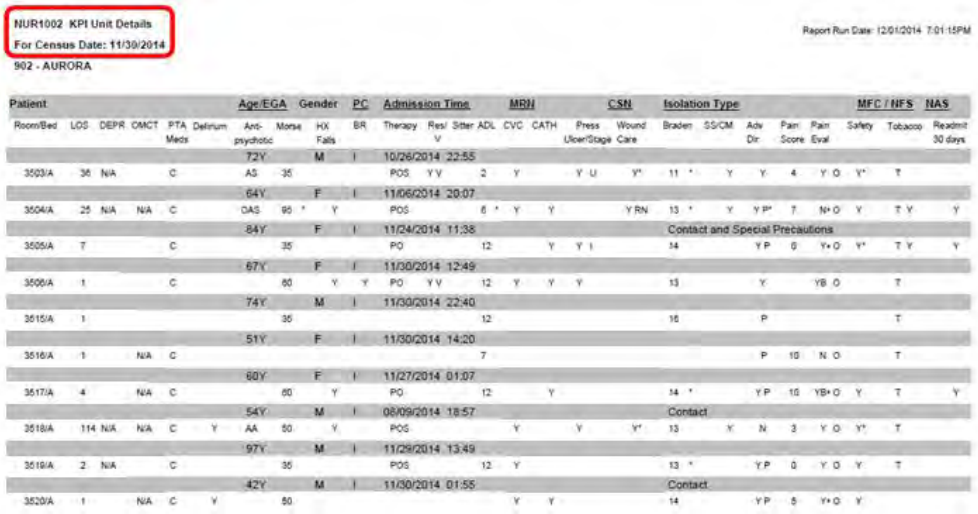
3) **POC-specific content and clinical decision support tools in the EHR**
   - Standardized assessments including reliable/valid assessment tools



- Designing evidence-based care planning processes to fit into the nursing workflow
  - Renewing the focus on planning and evaluating patient care
  - Creating clinical decision-support (CDS) tools to identify risks and actual problems
  - Designing care plans to plan care and link with flowsheets to "associate" documentation of patient status and/or interventions with the plan of care.



- Electronic reports are used to support quality improvement and research
  - POC-specific content can be extracted from the EHR for secondary use for patient care, quality improvement, and research
  - Reports are most effective when used to evaluate end-user skills and to provide near-real time feedback


NUR1002 KPI Unit Details
For Census Date: 11/30/2014
902 - AURORA
Report Run Date: 12/01/2014 7:01:15PM

Patient						Age/EGA		Gender	PC	Admission Time			MRN		CSN		Isolation Type						MFC / NFS	NAS
Room/Bed	LOS	DEPR	CMCT	PTA Meds	Delirium	Anti-psychotic	Morse	HX Falls	BR	Therapy	Res/V	Sitter	ADL	CVC	CATH	Press Ulcer/Stage	Wound Care	Braden	SS/CM	Adv Dir	Pain Score	Pain Eval	Safety	Tobacco	Readmit 30 days
						72Y		M	I	10/26/2014 22:55															
3503/A	36	N/A		C		AS	35			POS	Y	V	2	Y		Y	U	Y*	11 *	Y	Y	4	Y	O	Y*	T	
						64Y		F	I	11/06/2014 20:07															
3504/A	25	N/A	N/A	C		OAS	95 *	Y		POS			6 *	Y	Y		Y	RN	13 *	Y	Y	P*	7	N•	O	Y	T	Y	Y
						84Y		F	I	11/24/2014 11:38									Contact and Special Precautions								
3505/A	7			C			35			PO			12		Y	Y	I		14			Y	P	0	Y•	O	Y*	T	Y	Y
						67Y		F	I	11/30/2014 12:49															
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						74Y		M	I	11/30/2014 22:40															
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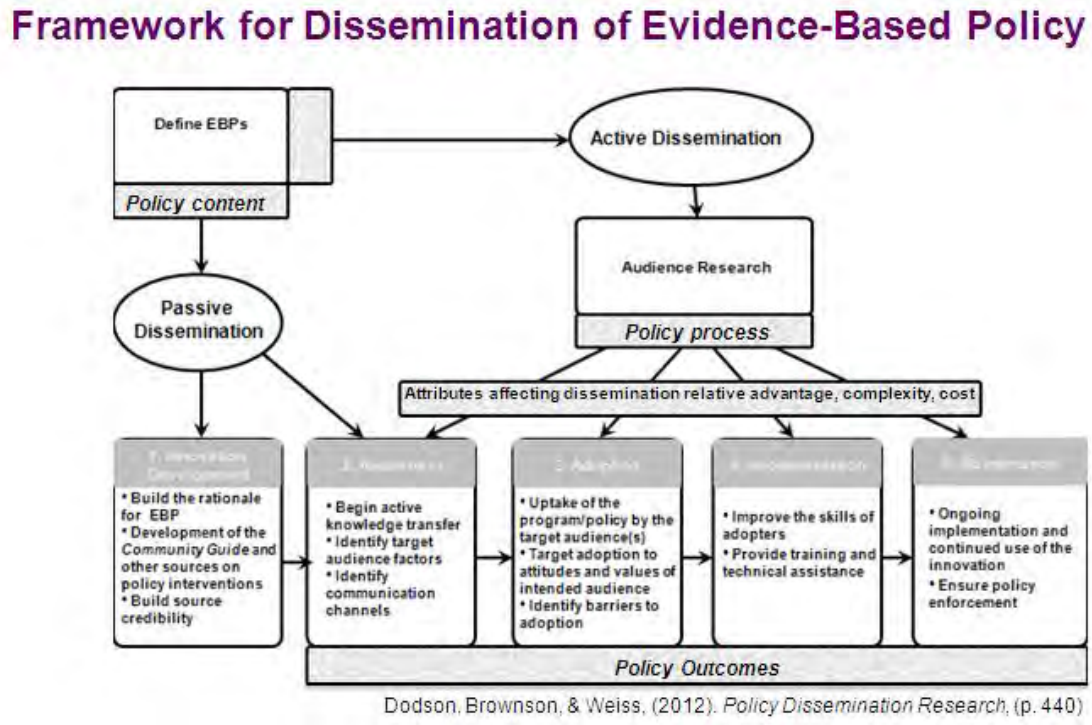
3517/A	4		N/A	C			60	Y		PO			12		Y				14 *			Y	P	10	YB•	O	Y	T		Y
						54Y		M	I	08/09/2014 18:57									Contact								
3518/A	114	N/A	N/A	C	Y	AA	60		Y	POS				Y		Y		Y*	13		Y	N	3	Y	O	Y*	T		
						97Y		M	I	11/29/2014 13:49															
3519/A	2	N/A		C			35			POS			12	Y					13 *			Y	P	0	Y	O	Y	T		
						42Y		M	I	11/30/2014 01:55									Contact								
3520/A	1		N/A	C	Y		60							Y	Y				14			Y	P	5	Y•	O	Y			

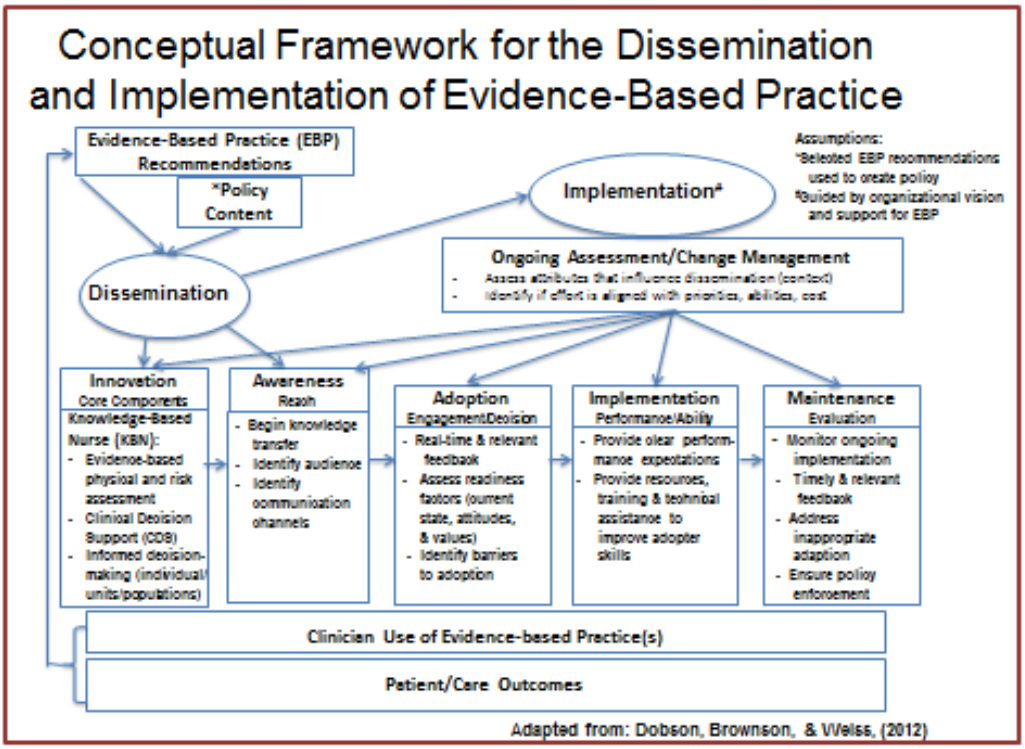
APPENDIX C. Dissemination & Implementation of Evidence-Based Practice Frameworks

Original Theory:



Dodson, Brownson, & Weiss, (2012). *Policy Dissemination Research*, (p. 440)

Adaption of Model by KBN Research Team (in collaboration with TIDIRH experts):



Adapted from: Dobson, Brownson, & Weiss, (2012)

APPENDIX D. Baseline Findings

Unit Characteristics (N=23; All Adult)	*M*	*SD*	*Range*
Critical Care (n=5: CVICU, CICU, SICU, MRICU, NEICU)			
Unit Size (# of Beds)	21.6	6.5	14-30
Total Hours per Patient Day	18.37	1.5	17.16 – 20.69
% RN Hours per Patient Day	90%	0.03	83 – 91%
Average Number of RNs per Unit	74	16.5	48 – 92
Moderate Acuity (n= 5: 8 Center, 9S, 9T, 10S & 10T)			
Unit Size (# of Beds)	23.8	0.4	23 - 24
Total Hours per Patient Day	10.5	0.6	9.62 – 11.07
% RN Hours per Patient Day	60%	0.06	53 – 65.5%
Average Number of RNs per Unit	34	3.1	31 - 39
Medical-Surgical Combined(n=6: 3CD, 3EF, 6KLM, 10LM, 11S & 11T)			
Unit Size (# of Beds)	23.8	0.4	23 – 24
Total Hours per Patient Day	10.5	0.6	9.62 – 11.07
% RN Hours per Patient Day	60%	0.06	53 – 66%
Average Number of RNs per Unit	34	3.1	31 – 39
Blended Acuity (n=2: 5KLM & 4EF)			
Unit Size (# of Beds)	27	1.4	26 -28
Total Hours per Patient Day	10.30	1.1	9.52 -11.06
% RN Hours per Patient Day	60%	0.07	57 – 67%
Average Number of RNs per Unit	28.5	12	20 – 37
Medical (n=5: 4KLM, 9LM, 11LM, 12S & 12T)			
Unit Size (# of Beds)	25.7	3.6	23 – 32
Total Hours per Patient Day	9.6	0.3	10.55 – 11.02
% RN Hours per Patient Day	60%	0.04	53 – 62%
Average Number of RNs per Unit	27.2	6.8	24 – 40

Unit Characteristics (N=23; All Adult)	#	%	*Range*
Critical Care (n=5: CVICU, CICU, SICU, MRICU, NEICU)	**370**	**39.07%**	
Staging: Competent/Proficient	182	49.19%	39.13-75.00%
Staging: Accomplished / Expert	183	49.46%	25.00-57.53%
Total Number of Identified "SuperUsers"	30	8.11%	4.76-17.81%
Total Number of Certified Staff Nurses	49	13.24%	8.22-16.67%
Moderate Acuity (n= 5: 8 Center, 9S, 9T, 10S & 10T)	**170**	**17.95%**	
Staging: Competent/Proficient	83	48.82%	26.47-64.71%
Staging: Accomplished / Expert	89	52.35%	35.29-69.23%
Total Number of Identified "SuperUsers"	25	14.71%	10.26-22.58%
Total Number of Certified Staff Nurses	12	7.06%	0.00-19.35%
Medical-Surgical Combined (n=6: 3CD, 3EF, 6KLM, 10LM, 11S & 11T)	**182**	**19.22%**	
Staging: Competent/Proficient	130	71.43%	56.00-81.08%
Staging: Accomplished / Expert	50	27.47%	18.92-44.00%
Total Number of Identified "SuperUsers"	38	20.88%	0.00-46.15%
Total Number of Certified Staff Nurses	27	14.84%	2.70-26.92%
Blended Acuity (n=2: 5KLM & 4EF)	**57**	**6.01%**	
Staging: Competent/Proficient	30	52.63%	43.24-70.00%
Staging: Accomplished / Expert	27	47.37%	30.00-56.76%
Total Number of Identified "SuperUsers"	10	17.54%	0.00-27.03%
Total Number of Certified Staff Nurses	10	17.54%	0.00-27.03%
Medical (n=5: 4KLM, 9LM, 11LM, 12S & 12T)	**133**	**14.04%**	
Staging: Competent/Proficient	85	63.91%	44.00-88.24%
Staging: Accomplished / Expert	48	36.09%	11.76-58.62%
Total Number of Identified "SuperUsers"	9	6.77%	2.94-13.79%
Total Number of Certified Staff Nurses	12	9.02%	2.94-24.14%

Nurse Survey Participant Characteristics (N=479)

Characteristics	N	%	M	SD	Range
Age (years)			36.1	11.8	22-66
Registered Nurse Years			9.9	11.3	0 - 45
Role / Years in Role	479	100 %	7.1	8.8	0-43
Staff Nurse (Units)	417	87 %	6.8	8.8	0-43
Staff Nurse (Float Pool)	19	4 %	10.6	8.1	0.5-26
Manager	19	4 %	7.8	9.3	0.5-34
CNS/NC	18	4 %	11.7	8.6	4-32
Other	6	1 %	5.7	8.7	0.5-21
Female	430	90 %			

Nurse Survey Participant Characteristics (N=479)

Characteristics	N	%
Education		
Associate Degree/Diploma	99	21 %
BSN	342	72 %
MS or Higher	34	7 %
Other	3	<1 %
Certification	113	25 %
Shift Length (68% some 12 shifts)		
12 hour only	215	45 %
8 & 12 hour	111	23 %

Unit Context

Characteristics	N	%
Completed KBN-based Learning Modules		
Any module	363	76 %
All Cerner & Epic modules	58	12 %
Did not answer	67	14 %
Structural & Electronic Resource Use at Work (last typical month) – Never/Rarely/NA		
Policies and procedures	57	12 %
Clinical Practice guidelines	72	15 %
Clinical decision-support (CDS)	205	44 %
Staffing - Disagree or Strongly Disagree		
Enough Staff for Necessary Work	141	30 %
Enough Staff to Deliver Quality Care	176	38 %

Knowledge-Tests Scores

Key: Total Score includes # Correct, # Not Correct, and # Missing (approx 10%)
High % Correct refers to person who scored the highest in each group

Total (41 Questions) Score	Average # Correct	Average % Correct	SD	High % Correct
All Participants (N=479)	22.7	55.3%	8.5	92.7%
All Staff Nurses (n=436)	22.2*	54.1%	8.4	87.8%
Staff (n=419)	22.4	54.6%	8.2	87.8%
Float Pool (n=19)	18.8	46.0%	12.2	78.0%
Nurse Leaders (n=37)	26.8*	65.4%	6.1	90 .2
Managers (n=19)	26.5	64.6%	4.6	80.5%
CNS (n=12)	30.1	73.4%	8.8	92.7%
NC (n=6)	31.7	77.2%	2.7	85.4%
Other (n=5)	22.6	55.1%	9.1	82.9%

*Sign diff Lv5

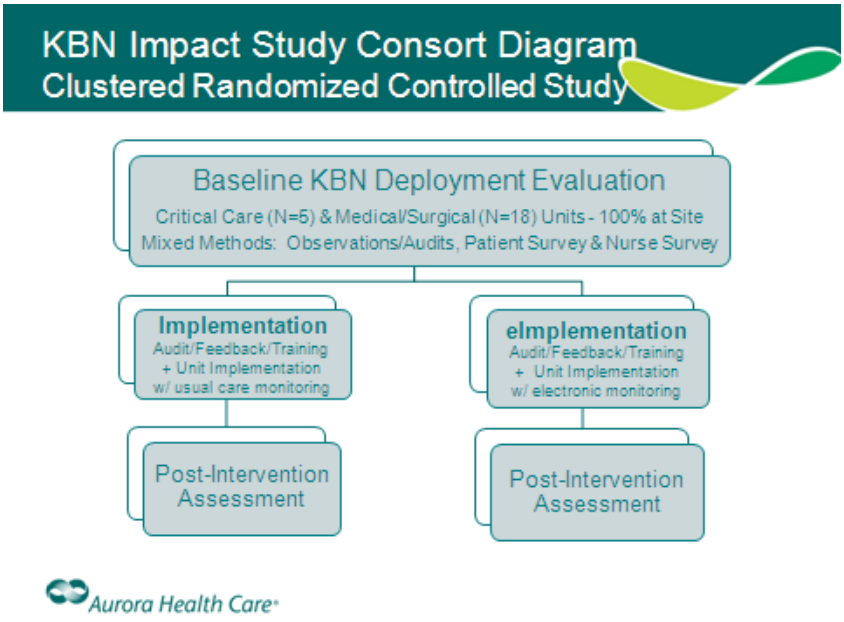
Knowledge – Subscale Scores

Subscale Score	N	Average # Correct (Mean)	Std Dev	Min	Max	% Correct	High % Correct
Pain (9Q)	479	4.3*	1.8	0	8	47.3	89
Medication Adherence (4Q)	479	2.6	1.2	0	4	64.0	100
Depression/Suicide (5Q)	479	3.5*	1.4	0	6	69.2	100
Fall Risk (6Q)	479	3.3*	1.5	0	6	55.1	100
Pressure Ulcers (4Q)	479	2.0*	1.2	0	4	49.3	100
Delirium (4)	479	1.5	1.1	0	4	38.7	100
Workflow (9Q)	479	5.4*	2.7	0	9	60.4	100
Total Score (41Q)	479	22.7*	8.5	0	38	55.3	93

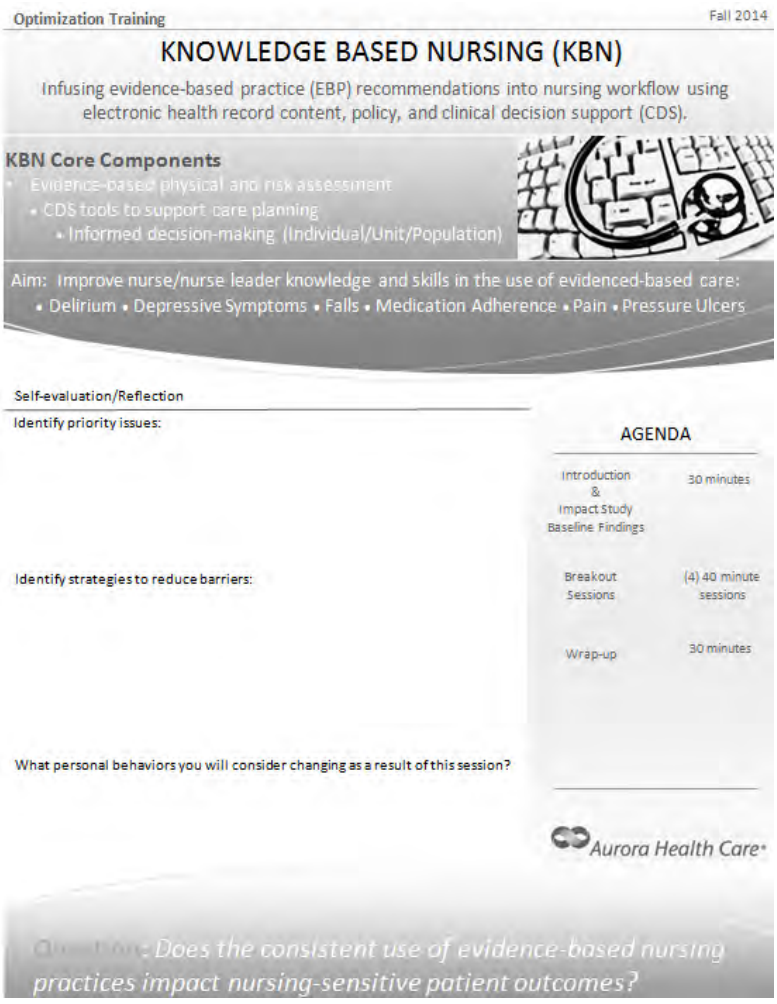
*Sign diff Lv5

Key: Total Score includes # Correct, # Not Correct, and # Missing (approx 10%)
High % Correct refers to person who scored the highest in each group

APPENDIX E. Study Intervention with Varied Maintenance Strategies (Group A & B)



Audit, Feedback and Training



Knowledge Based Nursing (KBN) Behavioral Expectations

Goal: Promote use of evidence-based, patient-centered practices with accurate, meaningful, and efficient documentation

Navigator / Flowsheets / Care Planning

- Use Navigators to ensure timely completion of all components of the workflow
- Use "Monitoring" flowsheets (e.g. Frequent, PCA/Epidural, Complex, Cardiac, Neuro, Stroke) – ONE STOP SHOP
- Review "Active LDAs" on admission/transfer (edit properties/resolve)
- Manage "Best Practice Advisories" (don't acknowledge if not done)
- Create and maintain PLAN OF CARE (select/remove/edit; Review individualized plan early in shift)
- Know how to see "Care Plan & Patient Education" (LCV on Patient Story or All on Care Plan Overview)
- Ensure care plan outcome documentation accurately reflects progress
- Use "Care Plan" notes to capture issues and interventions when outcomes/interventions NOT MET

Mental Status (Delirium Risk/Actual) / Depressive Symptoms

- Ask questions to evaluate mental status (see ref text)
- Use parameters beyond orientation/memory to describe confusion (LOC, attention, & thought process)
- Effectively identify change from baseline OR fluctuating status
- Use CAM-ICU for ICU patients who are unable to speak (e.g. intubated patients)
- Select and carry out delirium prevention activities
- Report/confirm delirium, aggressively treat cause(s) and manage with non-pharmacological interventions Search/treat additional causes when symptoms persist (> 24 hrs)
- Limit use of anti-anxiety and/or sedation medication
- Use depression screening tools to assess and support medical (BPA) and symptomatic (manual) patients

Pain – Comfort/Function

- Select ONE appropriate pain assessment tool (self-report vs. behavior; age-appropriate)
- Partner with patient to set realistic comfort function goal (Typical = 3 or 4)
- Evaluate "acceptable" pain control based on reported pain rating at or below their goal
- Identify symptoms of "opioid tolerance" and deals with heightened pain symptoms at end of drug duration
- Individualize Pain Care Plan: goals based on tool/department, pain interventions (vs. comfort)
- Monitor function with actual observations using tool descriptors: Braden, Morse, ADL Index
- Conduct "Get Up" (Egress) testing when needed: Bed mobility, dangle/stand, walk
- Support early mobilization: upright w/in 24 hrs (if tolerated); Up 2-4x/day (increase frequency/intensity/duration); in hallway 1-2x/day
- Monitor pain management/oversedation using PCA / Epidural /Opioid flowsheet

Patient Education

- Identify barriers and preferences for learning during admission (e.g. literacy question, mental status/affect,
- Screen older adults (65+ yrs) for cognitive impairment: Orientation, Memory, Cognition Test (OMCT)
- Identify learning needs - many patients have had with prior stays
- Deliver (and document) individualized education with comments about content or how barriers addressed
- Use visual aids to review important messages about what patients need to DO ("patient engagement")
- Avoid redundancy: If patient verbalized understanding – why repeat?
- Conduct "focused medication assessment" to identify issues (especially if readmission)
- Implement interventions if at risk or actual medication nonadherence issues

Optimization Training Session Evaluation Results

Leader N=42, RN N=801

1 At the end of this program, I am able to: Briefly describe what Knowledge-based Nursing (KBN) is and how evidence-based practices are embedded into the electronic health record to support patient care

	Leader		RN	
	N	**%**	**N**	**%**
Strongly Agree + Agree	39	92.86%	778	97.13%

2 At the end of this program, I am able to: Report two key findings from baseline that you find most relevant and appropriate for considering as a practice change

	Leader		RN	
	N	**%**	**N**	**%**
Strongly Agree + Agree	39	92.86%	741	92.51%

3 At the end of this program, I am able to: Validate and/or update your knowledge and skills in performing and efficiently documenting essential evidence-based practice recommendations related to:

	Leader		RN	
3a Navigators/Flowsheets/Care Planning	**N**	**%**	**N**	**%**
Strongly Agree + Agree	39	92.86%	776	96.88%
3b Mental Status	**N**	**%**	**N**	**%**
Strongly Agree + Agree	42	100%	786	98.13%
3c Pain	**N**	**%**	**N**	**%**
Strongly Agree + Agree	41	97.62%	784	97.88%
3d Pt. Education	**N**	**%**	**N**	**%**
Strongly Agree + Agree	41	97.62%	723	90.26%

5 How committed are you to implementing these practices?

	Leader		RN	
	N	**%**	**N**	**%**
Strongly Agree + Agree	40	95.24%	765	95.51%

6 Would you recommend this training session to others in your role?

	Leader		RN	
	N	**%**	**N**	**%**
Strongly Agree + Agree	39	92.86%	687	85.77%

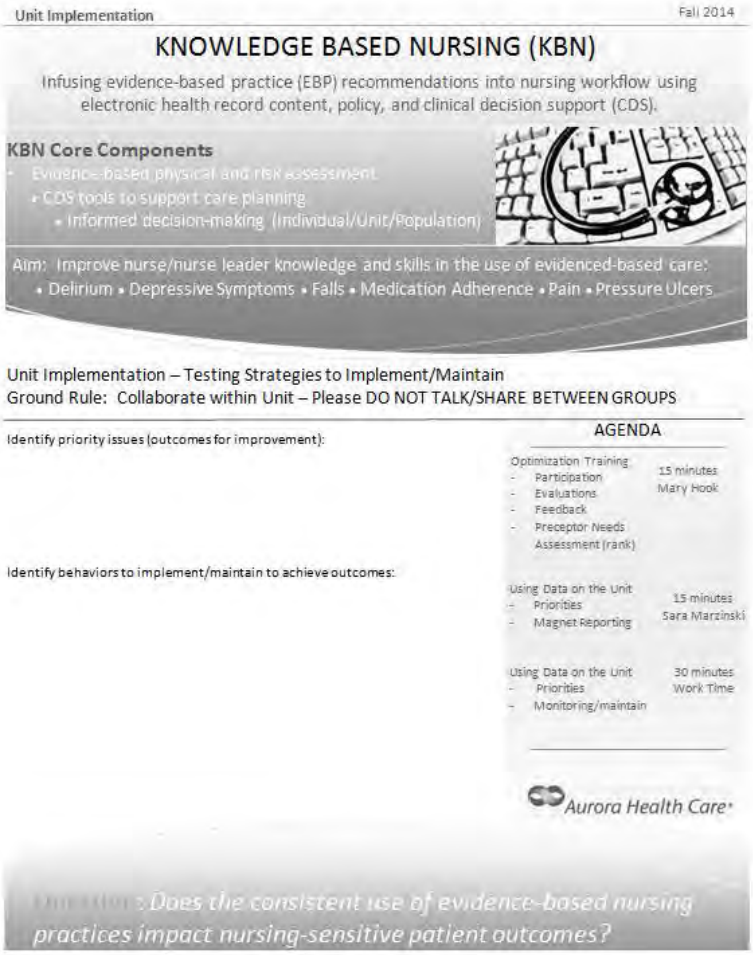
7 Identify breakout sessions where your knowledge of the topic increased after participation:

	Mental Status/ Depression	**Pain/Function**	**Patient Ed/Med Adherence**	**Navigators/Flowsheets/Care plan**
Leader (N)	**26**	**16**	**13**	**28**
Leader (%)	61.90%	38.10%	30.95%	66.67%
RN (N)	**492**	**264**	**220**	**489**
RN (%)	61.42%	32.96%	27.47%	61.05%

Unit Description with Randomized Study Group Assignments

Study Group (Randomized)	**Unit Type**	**# of Staff** (3/2014)	**Associated Units # Staff** (3/2014)	**Total Staff in Group**	**# Beds**	**Avg # IP/mo** (3/2014)
	Critical Care Units (5 Units - 370 Staff; 74=Avg Staff /Unit; SD=16.6 Range=48-92;					
B	Neurosurgical ICU (3M/1L)	73	6KLM (37) 10LM (30)	140	16	96
B	Medical/Respiratory ICU (8T)	84	12S (25), 12T (20) 4KLM (34) 4EF (37) 9LM (29)	226	24	114
B	Surgical ICU (3L/3M)	48	3CD (25), 3EF (40), 8C (34),11S (24), 11T (26)	197	14	70
A	Coronary ICU (8S)	73	5KLM (20), 10S (31), 10T (32), 11LM (25)	181	24	118
A	Cardiovascular Surgical ICU (7T)	92	9S (39) 9T (34)	165	30	92
A	Clinical Staffing Service (CSS/Float Pool)	35		35		
	Medical/Surgical Units 18 Units – 542 Staff – 30 = Avg Staff/Unit; SD=6 Range=20-40					
11 S	Orthopedics/Surgical	24	SICU		24	150
11T	Orthopedics/Surgical	26	SICU		24	154
12 S	Oncology	25	MRICU		24	103
12T	Oncology	20	MRICU		24	94
3CD	Surgical	25	SICU		23	125
3EF	Surgical	40	SICU		26	134
4EF	Medical/Telemetry	37	MRICU		26	143
4KLM	Medical	34	MRICU		32	139
5KLM	Medical	20	CICU		28	130
6KLM	Surgical Neurology	37	NEICU		33	83
8 Center	Med/Surg Transplant	34	SICU		23	131
9LM	Medical/Telemetry	29	MRICU		23	108
10LM	Medical/Neurology	30	NEUICU		28	114
11LM	Medical/Heart Failure	25	CICU		23	104
9S	Cardiac Surgical Step Dn	39	CVICU		24	81
9T	Cardiac Surgical Step Dn	34	CVICU		24	73
10S	Cardiac Procedural	31	CICU		24	91
10T	Cardiac Medical	32	CICU		24	121
Total		947				2,568

Curriculum for Unit Implementation (including Nurse Leaders and Preceptors)



Training for Varied Maintenance Strategies (Group B was given Key Performance Indicator Report)

NUR1002 KPI Unit Details
For Census Date: 11/30/2014
902 - AURORA

Report Run Date: 12/01/2014 7:01:15PM

Patient						Age/EGA		Gender	PC	Admission Time				MRN			CSN	Isolation Type					MFC / NFS		NAS
Room/Bed	LOS	DEPR	OMCT	PTA Meds	Delirium	Anti-psychotic	Morse	HX Falls	BR	Therapy	Res/V	Sitter	ADL	CVC	CATH	Press Ulcer/Stage	Wound Care	Braden	SS/CM	Adv Dir	Pain Score	Pain Eval	Safety	Tobacco	Readmit 30 days
						72Y		M	I	10/26/2014 22:55															
3503/A	36	N/A		C		AS	35			POS	Y V		2	Y		Y U	Y*	11 *	Y	Y	4	Y O	Y*	T	
						64Y		F	I	11/06/2014 20:07															
3504/A	25	N/A	N/A	C		OAS	95 *	Y		POS			6 *	Y	Y		Y RN	13 *	Y	Y P*	7	N• O	Y	T Y	Y
						84Y		F	I	11/24/2014 11:38								Contact and Special Precautions							
3505/A	7			C			35			PO			12		Y	Y I		14		Y P	6	Y• O	Y*	T Y	Y
						67Y		F	I	11/30/2014 12:49															
3506/A	1			C			60	Y	Y	PO	Y V		12	Y	Y	Y		13		Y		YB O		T	
						74Y		M	I	11/30/2014 22:40															
3515/A	1						35						12					16		P				T	
						51Y		F	I	11/30/2014 14:20															
3516/A	1		N/A	C									7							P	10	N O		T	
						60Y		F	I	11/27/2014 01:07															
3517/A	4		N/A	C			60	Y		PO			12		Y			14 *		Y P	10	YB• O	Y	T	Y
						54Y		M	I	08/09/2014 18:57								Contact							
3518/A	114	N/A	N/A	C	Y	AA	60	Y		POS				Y		Y	Y*	13	Y	N	3	Y O	Y*	T	
						97Y		M	I	11/29/2014 13:49															
3519/A	2	N/A		C			35			POS			12	Y				13 *		Y P	0	Y O	Y	T	
						42Y		M	I	11/30/2014 01:55								Contact							
3520/A	1		N/A	C	Y		60							Y	Y			14		Y P	5	Y• O	Y		

Legend: DEPR=Depression (Addl Scr): Y=Done; (*) Score >5 (Mild/Mod Dep); N/a = surgical/ICU; UTA= Unable to assess; OMCT (Addl Scrn) Y=Done; (*) Score >7 (Mild imprmt); PTA Meds: C=Complete; (*) Not taking meds. Delirium = Symptoms present or CAM-ICU (+) within last 48 hours, Anti-psychotic = Haloperidol (H) / Seroquel (S), Zyprexa, (Z), Risperidone (R) Abilify (A) &O=Ordered,A=Administered in last 48 hrs, Morse = Morse (* = Current Score > Admit Score),. HX Falls = Morse History of Falls - *=Inpatient Fall, BR = Bed rest (MD Order), Therapy = Therapy (P=P/T,O=O/T,S=Speech), Res/V = Restraints w/ Ventilator (V) mode entered, Sitter = Charges for a sitter entered for the prior day, ADL=ADL (* = Current Score < Admit Score), CVC= Central Line = Y (Inserted Current Visit) or Y* (Inserted PTA), CATH = Urinary Catheter= Y (Inserted Current Visit) or Y* (Inserted PTA). Press Ulcer=Y (Present on Admission) or Y*(Acquired Current Visit), Stage documented in last 7 days = Blank = Not Documented or Not a Pressure Ulcer, I=Stage I, DTI= Suspected deep tissue injury, U= Unstageable/necrotic tissue, MM=PU on mucous membrane, II= Stage II, III = Stage III, IV = Stage IV, Wound Care=Y=Consult: RN, MD or (*)=Both RN,MD, Braden=Braden (* = Current Score < Admit Score), SS/CM: Y= Consult Social Services/Care Management, Adv Dir = Advance Directives: Y= Yes, N=No, P=Power of Attorney for Healthcare, L=Living Will, D=DNR, G=Guardianship, I=Interim, O=Other,(*) = POAHC Activated; Pain Score=LCV Pain Score, Pain Eval LCV: Y= Acceptable; N=Unacceptable; (*)= 2+ unacceptable evals in row past 24 hrs. B=Beh Tool for Confused/AD only: O=Opioid given last 24 hrs; Safety:Y= Points Partnering, ID & Hand Hygiene =Verb/Demo - (*) if >48 hrs of admit, Tobacco: T=current/past Smoker; Y= Verb/Demo,(*) if >48 hrs; 30 Day Readmission=Y; Maternal Feeding Choice (MFC)/Neonatal Feeding Status (NFS): B=Breast, F=Formula, B+F = Breast + Formula; NFS=(*) if Breast & ANY Formula w/ Supp indications (LCV) =Biological (B),

Preceptor Tracking Tool

Name: ____
Unit: ____

Aurora Health Care

DATE	# OF HOURS	ACTIVITY (check all that apply)	Comments
		Preceptor Training - Parkway Training Center	
		☐ Education ☐ Leader collab. ☐ Auditing ☐ Informal f/u w/staff ☐ Preceptor-Preceptor collab.	
		☐ Formal f/u (ACC meeting) ☐ OFT's/Huddle ☐ Other:____________	
		☐ Education ☐ Leader collab. ☐ Auditing ☐ Informal f/u w/staff ☐ Preceptor-Preceptor collab.	
		☐ Formal f/u (ACC meeting) ☐ OFT's/Huddle ☐ Other:____________	
		☐ Education ☐ Leader collab. ☐ Auditing ☐ Informal f/u w/staff ☐ Preceptor-Preceptor collab.	
		☐ Formal f/u (ACC meeting) ☐ OFT's/Huddle ☐ Other:____________	
		☐ Formal f/u (ACC meeting) ☐ OFT's/Huddle ☐ Other:____________	
		☐ Education ☐ Leader collab. ☐ Auditing ☐ Informal f/u w/staff ☐ Preceptor-Preceptor collab.	
		☐ Formal f/u (ACC meeting) ☐ OFT's/Huddle ☐ Other:____________	
		☐ Education ☐ Leader collab. ☐ Auditing ☐ Informal f/u w/staff ☐ Preceptor-Preceptor collab.	
		☐ Formal f/u (ACC meeting) ☐ OFT's/Huddle ☐ Other:____________	
		☐ Education ☐ Leader collab. ☐ Auditing ☐ Informal f/u w/staff ☐ Preceptor-Preceptor collab.	
		☐ Formal f/u (ACC meeting) ☐ OFT's/Huddle ☐ Other:____________	
Total Hours			

Hours should be charged to the KBN Study org and area (505-3969). Either use the Kronos clock or work with your timekeeper to transfer hours.

Please return this form to Nichole Nikolic (email: nichole.nikolic@aurora.org,or fax: 414-219-5693)

Additional Information re: Preceptors

1. **Preceptor Characteristics:**
    a. Nursing Credential (Degree)
    b. Certification
    c. Years as an RN
    d. Years as a Preceptor
    e. Completed Formal (class/on-line) Preceptor Training

2. **Knowledge and Skills Regarding Using Tools to Support Maintenance**
    a. **Tool(s) in Use**
    1) KPI Daily, 2) Chart Audit Tool, 3) Homemade Tool, 4) Written Notes, 5) Other

    b. **KPI-Daily Report Access Skill** (opens & finds latest report & unit data)
    1) Independent, 2) With (1) cue to get, 3) Needed (>1) cue to get, 4) Needed Review of all, 5) Not Taught-A, 6) Other (describe)

    c. KPI-Daily Use Skill (Knows where to locate & track at least one parameter)
    1) Independent, 2) With (1) Cues to get 3) Needed (>1) Cue to get, 4) Needed Review of all 5) Not Taught-A, 6) Other (describe)

    d. KPI-Daily Interpretation Skill (Knows where to locate & track at least one parameter)
    1) Independent, 2) With (1) cue to get, 3) Needed (>1) cue to get, 4) Needed Review of all 5) Not Taught-A, 6) Other (describe)

APPENDIX F: KBN Impact Study – Projected Timeline Year 3